

Chapter 2

Description of Alternatives

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2.1 Introduction

NEPA requires consideration of alternatives that address important issues identified during the scoping process. This chapter describes and compares three programmatic alternatives for managing the Pacific salmon resource, including the No-Action Alternative, for three management areas (i.e., Southeast Alaska, Pacific Coast, and Columbia River basin). The discussion of alternatives is the foundation of the NEPA process (40 CFR 1502.14).

NMFS' review of annual fishery management plans and management agreements responds to interrelated actions by numerous agencies. As part of its review of annual fishery plans, NMFS may suggest or require changes to a management plan if it does not adequately address conservation goals, socioeconomic factors, treaty rights, trust responsibilities, or commitments related to the Pacific Salmon Treaty through its authorities related to the MSA

or ESA. This FPEIS analyzes the physical, biological, and human effects of proposed alternatives for salmon fisheries management, which may be considered or recommended by NMFS as part of its annual review process and implemented by the State and other agencies responsible for managing the fisheries. As discussed in Chapter 1, this FPEIS is not intended to explore NMFS' jeopardy determinations. The FPEIS, therefore, considers only alternatives consistent with jeopardy standards NMFS established in previous consultations and biological opinions (i.e., the proposed alternatives would not jeopardize listed species of salmon).

The alternatives considered and analyzed in this FPEIS were formulated based on scoping comments and scientific information in a manner consistent with NEPA guidelines. Alternatives considered but eliminated from detailed study are also presented and discussed along with the rationale for exclusion. Status quo management (i.e., the current management scheme) is considered Alternative 1-No-Action and is the baseline against which the environmental, social, economic, and other aspects of the action alternatives are compared. Effects associated with each alternative compared to Alternative 1 are presented in Chapter 4. The cumulative effects on the biological and human environment of these actions, when combined with other related actions, are also presented in Chapter 4.

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2.1.1 Discussion of Fishery Management Measures

In general, fisheries are managed to meet conservation and socioeconomic objectives. Management measures are the tools used to help fisheries meet those objectives and are described below:

Quota management-where catches are monitored and fishing is closed when a pre-established quota has been reached, quota management can provide a more certain means for limiting harvest in ocean fisheries. A disadvantage to this approach is the inability of commercial anglers, anglers, and fishing-related businesses to plan operations because they do not know with certainty the timing or duration of seasons.

Season management-Based on estimates of the harvest that may be achieved by a given fleet of anglers over a given amount of time and the expected return of fish to an area, managers set opening and closing dates for a fishery. The season is not limited by actual harvest, but by these opening and closing dates. When the spawning escapement of a particular run or runs can be directly observed or estimated during the course of the fishing season, and when fisheries are geographically and temporally concentrated, season management can provide a relatively reliable means for limiting fisheries to achieve conservation objectives. For runs taken in ocean fishing areas, this is seldom the case. In Columbia River fisheries, escapement can often be directly observed or estimated as fish transit dams, and season opening and closing dates can be adjusted.

Time/area management-Time/area management combines temporal and geographic restrictions. Openings and closures depend on the migratory timing and routes of different stocks. For instance, in a year when the coastal coho run is expected to be small, an area of the Oregon coast may be open in May and June when chinook are abundant, but closed in July when coho are more abundant. Time-area management is the mainstay of management measures used under Alternative 1 for the Pacific Coast and Columbia River.

Size limits-Size limits are usually applied in salmon fisheries to protect juvenile fish in a population, but may respond to a socioeconomic or aesthetic preference for harvesting larger fish. Size limits may or may not provide a conservation benefit.

Gear restrictions-Gear restrictions proscribe the general type of gear that can be used in an area for particular classes of anglers. Only hook-and line gear can be used for commercial and sport salmon fishing in ocean areas off California, Oregon, and Washington and in the EEZ off Southeast Alaska. The number of lines and lures that can be used by commercial fishers is also limited, although the number varies by area. Anglers can typically use only one line. Non-Tribal commercial fishermen in the Columbia River are limited to the use of gillnets. Other gear types used historically for commercial fishing, including traps, fish wheels, seines, and other devices, were prohibited by legislation in place by the mid-1900s. Restricting harvest methods to gillnets favored a distribution of harvest among a larger number of lower-volume harvesters as opposed to the concentration of harvest that occurred when traps and fish wheels took a larger portion of the harvest. Tribal fishermen can use a variety of gear, including gillnets, weirs, hook-and-line, spears, and other types. The species or size composition of hook-and-line catches may be influenced by regulating the type, size, and depth at which lures are fished. The size of gillnet mesh may be regulated to target one

species or size of fish. Hook size or type (barbed or barbless, circle other style) may be regulated to increase survival of released fish.

License requirements and fleet limits-Catch can be limited by controlling the size of the fleet through licensing and limited entry programs. Most jurisdictions limit the fleet size through various kinds of permit programs. Licensing fees help pay management costs, but also place at least a minimum cost on continued participation in a fishery. This may encourage marginal participants to drop out of a fishery.

Each of the three management areas use these measures, either alone or more often in combination, to provide the opportunity to catch harvestable fish within the limits set for conservation.

Because of the highly migratory nature of salmon, some stocks are caught in mixed-stock fisheries at great distances from natal streams. These fisheries affect a more complex mix of stocks, and, because of their timing and distance from terminal areas, they are most often managed based on preseason estimates of abundance and stock composition. Quotas and other management measures are designed to balance the desire for opportunity and relatively stable fisheries against the relative uncertainty about the status of the affected stocks.

Fisheries closer to the terminal areas affect fewer stocks and, because of their location, can often be shaped inseason according to real-time information about the status of the returning stocks. Catches in more terminal fisheries tend to be more variable as they are restrained in low-run years to meet conservation objectives but can be more aggressive when runs are up. All of the available management measures are used, in various combinations, to deal with the unique circumstances of each fishery.

2.2 Alternatives Considered for Detailed Analysis

The alternatives considered for analysis were developed by NMFS and cooperating agencies, as well as from oral and written public comment.

To reiterate, the federal action and the proposed alternatives address the review of annual fishery management plans that formulate management measures, not framework fisheries plans such as the Pacific Coast Salmon Plan, which set conservation objectives. Although alternatives consisting of different conservation objectives were not considered, the ability of alternatives to meet conservation objectives under a range of environmental conditions that are represented by comparing two baselines was considered as part of the effects analysis.¹

The criteria applied in narrowing the range of alternatives included:

1. Relevance to the Action-Does the alternative characterize a management measure that could be promulgated by one of the three jurisdictions and thus be subject to NMFS review, or does it characterize a management approach that might be recommended or required by NMFS as part of its consultation?

¹ More rigorous use of escapement goal management may aid NMFS recovery efforts for some listed species and is discussed in Chapter 4. Because the federal action concerns the ability of fishery management plans to meet conservation objectives determined by NMFS to be sufficient for meeting ESA jeopardy or recovery standards, and because NMFS has approved conservation objectives based on harvest rate management, modifying these management objectives was considered to be beyond the scope of this FPEIS and are not, therefore, considered further.

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2. Redundancy-Is the primary characteristic of the alternative contained in another, broader alternative?
3. Environmental Considerations-Could the alternative effectively address conservation mandates of the subject jurisdictions? Could the alternative effectively address conservation concerns of the ESA? Alternatives whose primary effect was likely to increase direct effects (i.e., short-term) on stocks of concern were eliminated.
4. Technical Feasibility-Is there evidence or compelling reason to expect that the alternative approach is technically feasible?
5. Economic Feasibility-Does the alternative (effectively) address the underlying socioeconomic mandates of the subject jurisdictions? Alternatives were not eliminated solely on the basis of economic considerations, but economic feasibility was taken into consideration with other criteria.

For each jurisdiction, a No Incidental Take Alternative (Alternative 3) is considered. In practice, there is an unlimited range of additional alternatives that consider incremental reductions in harvest (e.g., quotas or time/area restrictions) that could be implemented through a variety of management controls. To limit the number of alternatives considered, while still accurately describing the range of possible effects on the environment, it was expedient to rely on the No Incidental Take Alternative to define the outside range of effects. Alternative 3 provides an upper-bound estimate of the decrease in fisheries-related mortality and socioeconomic effects. It is important to point out that Alternative 3, unless necessary for reasons of conservation, is inconsistent with other legal mandates and policies related to treaty Tribal fishing rights and wise use directives. Existing case law provides that treaty Tribal fishing can be limited for conservation but only if the associated legal standards are first met. Other legal mandates and policies, including those contained in the Magnuson-Stevens Act, require that the affected fisheries be managed to achieve optimum yield on a continuing basis. The generic No Incidental Take Alternative considered in this FPEIS is inconsistent with these mandates and policies unless consistent with conservation requirements, but nonetheless serves to define the end point of a continuum of reduced effects on fisheries and how those affect the human, physical, and biological environments.

2.2.1 Southeast Alaska

The Southeast Alaska chinook harvest is currently managed based on an annual, all-gear catch quota established by the United States and Canada through the Pacific Salmon Commission. The quota is defined as part of the 1999 revision of Annex IV to the Pacific Salmon Treaty and specifies a variable allowable catch of treaty chinook based on an annual estimated abundance index of chinook salmon available to the Southeast Alaska troll fishery. In Alaska, the term “treaty chinook” means the total catch of chinook by all fisheries, less an allowance for the catch of Alaska hatchery production in excess of base period levels (termed “hatchery add-on”) and less the estimated harvest of certain Alaska-origin wild stocks in excess of the harvest observed during the base period (termed “terminal exclusion”). The allowable catch of treaty chinook does not include additional catches of Alaskan hatchery chinook salmon. The Alaska Board of Fisheries sets the allocation of the total allowable catch among gear types (troll, net, and sport. The set and drift gillnet fisheries are limited to 8,600 treaty chinook salmon, while the purse seine fishery is limited

to 4.3 percent of the all-gear quota. Of the treaty chinook remaining, 80 percent goes to the troll fishery and 20 percent to the sport fishery.

In all Southeast Alaska net fisheries, chinook are taken incidentally when other species are targeted. Set nets have the smallest effect of the three main types of net fisheries. They harvest primarily sockeye and coho, and are allowed a maximum incidental chinook take of 1,000 fish each year. Drift gillnets generally target sockeye and chum salmon and averaged 2.7 million salmon catch annually from 1960 to 1998. They are allocated an annual incidental harvest of 7,600 chinook. Purse seiners harvest 70 to 90 percent of all salmon caught in Southeast Alaska commercial fisheries. Pink salmon are the target species, all other species are generally harvested incidentally. Chinook account for less than 1 percent of the total purse seine salmon harvest.

The Southeast Alaska troll fishery is historically broken into two seasons: the winter troll season from October to April and the summer troll season, in which the majority of the chinook catch occurs. The number of treaty chinook available to the summer fishery is equal to the total troll quota less the winter season catch. In recent years, the summer fishery has opened on July 1 and has been open for a fixed number of days (usually 5 to 7 days) before the first closure. The management objective of the first opener is to harvest 70 percent of the total summer troll quota. After the closure, an inseason estimate of the abundance index is made based primarily on catch rates during the first opener. Allowable catch may be adjusted based on this inseason estimate. The fishery reopens in August for both chinook and coho, and the remainder of the quota is taken. During the second chinook season (August), areas of high chinook abundance are closed unless fewer than 30 percent of the total remaining allowable harvest was taken during the first open period.

The Southeast Alaska chinook sport fishery is managed to achieve a catch of 20 percent of the total allowable catch after subtraction of the allowable net harvests. Daily and annual catch limits are established each year based on the preseason estimate of the chinook abundance index. At lower abundances, special restrictions for charter vessels may be used as needed, including reduced bag and possession limits, prohibiting down riggers, and nonretention by charter boat fishers. The sport fishery management objectives are to attain the allocated harvest of chinook, allow uninterrupted sport fishing in salt waters for king salmon without exceeding the harvest ceiling, minimize restrictions on resident anglers not fishing from a charter boat, and to provide stability to the sport fishery by eliminating inseason regulatory changes other than for conservation purposes. To that end, inseason adjustments to the sport fishery catch and bag limits are not allowed.

The requirements of the Pacific Salmon Treaty are pivotal to management of the Southeast Alaska fishery and to conservation of listed and unlisted chinook stocks. Recent revisions to Annex IV of the Pacific Salmon Treaty result in an overall reduction in effects on listed chinook stocks. After reviewing the 1999 Pacific Salmon Treaty Agreement, NMFS concluded that it posed “no jeopardy” to listed chinook ESUs (NMFS 2000a).

2.2.1.1 Alternative 1-No Action

Alternative 1 is the approach used most recently by ADF&G to avoid harvest of salmon from listed ESUs, to achieve sustainable harvests of targeted chinook stocks in accordance with the Pacific Salmon Treaty, and to fulfill requirements mandated by the Alaska Board of

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Fisheries for allocating harvest among troll, net, and sport fisheries (NMFS 1997a). The most relevant features of this alternative include management measures intended to conserve chinook stocks, including those from listed ESUs. These management measures are:

1. An overall harvest quota for chinook that is set annually in relation to estimated total abundance of chinook in the Southeast Alaska fishery. The harvest quota is derived from requirements of the Pacific Salmon Treaty.
2. A prohibition on retaining chinook during specified periods of the general summer commercial troll season, known as chinook nonretention (CNR) fisheries.
3. Closure of certain areas known to have high concentrations of chinook during the CNR fisheries.

Other management measures for troll fisheries include:

- Regulations on the size of fish that can be retained (greater than or equal to 28 inches for chinook)
- The type of gear that can be used (hook-and-line)
- Season and area constraints in addition to those noted above.

Management measures for sport fisheries, and purse seine, gillnet, or other gear types would not be affected under Alternative 1. Descriptions of these fisheries and their management measures are in Chapter 3 and in the 1997 EA (NMFS 1997a). Pacific Salmon Treaty quotas are relevant to these fisheries because the combined harvest of all gear types cannot exceed the Pacific Salmon Treaty specified quota.

Management measures specific to Alternative 1 are as follows:

1. Chinook Harvest Quota: The Pacific Salmon Treaty quota sets the overall limit on harvest of chinook (excluding most Alaska hatchery stocks and some terminal exclusions from Southeast Alaska quota) and, by extension, limits take of chinook from listed ESUs, which are present in the treaty fisheries. The harvest quota is defined as part of Annex IV of the 1999 Pacific Salmon Treaty Agreement between Canada and the United States. It stipulates a variable harvest rate based on the estimated abundance of chinook in the fishing areas.² The average allowable chinook harvests for the two baselines (1988 to 1993 and 1994 to 1997) used in the analysis were 158,000 for the baseline reflecting years of lower chinook abundance (Baseline 1), and 281,000 for the higher chinook abundance baseline (Baseline 2).³ [Note: For purposes of analysis, provisions of the Treaty were applied to abundance levels observed during the two baselines. As a result, the modeled catch levels do not compare directly to actual catches.]
2. Chinook Nonretention Fishery: The chinook quota year for the troll fishery begins October 1 to ensure a winter troll fishery that is vital to the small communities. The

² Abundance and allowable harvest would be determined based on pre-season forecasts, in-season estimates, or both. Harvest rates are set according to an index calculated relative to the average estimated abundance of legal size chinook in fisheries waters between 1979 and 1982. A detailed description of methods is contained in Pacific Salmon Commission (PSC) 1995 and 1996 Annual Report (1999a).

³ Because abundances in future years are unknown, the analysis of effects contained in Chapter 4 is based on a retrospective calculation.

management plan calls for a delay from the traditional start of October 1 to October 11 to slow the catch rate. The season closes when either 45,000 fish are harvested or on April 14 to ensure fish are available for the spring and summer fisheries; this was instituted to minimize the CNR days during the summer season. The spring fisheries, open April 15 through June 30, are intensively managed to maximize the harvest of Alaska hatchery-produced chinook in terminal areas. Fishing time is regulated by the percentage of Alaska hatchery-produced chinook in the catch of each terminal fishery. This minimizes the harvest of treaty quota fish and provides for the largest carryover of treaty fish into the summer fishery. The summer fishery begins July 1 with the goal of harvesting 70 percent of the remaining troll quota. The areas of high abundance are open to provide a historic fishery and to provide a means of obtaining an inseason measurement of abundance that is consistent with that obtained by the fishery in 1980. ADF&G announces a closure of the chinook retention fishery when data indicate that the 70 percent is harvested and initiates the period of CNR fishing. All vessels must offload chinook salmon before resuming fishing and before the areas of high abundance are closed. Following any management action for coho salmon, the chinook retention fishery is re-opened with the areas of high abundance closed. The ADF&G announces a closure when data indicate that the remaining quota is taken. All vessels must again offload chinook salmon before resuming fishing. Chinook nonretention is again in effect with the areas of high abundance closed.

CNR fisheries allow commercial trollers to harvest coho salmon (and to a limited extent, pink, chum, and sockeye salmon) that are abundant during that time and that constitute a majority of the trollers' harvest. An estimated 21 percent of the legal-size chinook hooked and brought to boat in these fisheries die before or after being released (PSC 1997), thus listed chinook are still subject to incidental take and mortality.⁴ Because this is a directed coho fishery closure of chinook high abundance areas and CNR provisions are designed to minimize the bycatch of chinook.

3. **Area Closures:** To reduce incidental mortality of chinook during the coho-directed fishery, areas known to have high abundances of chinook during those times are closed. In general, these are areas adjacent to the westward shores of the Southeast Alaskan Archipelago out to 1 nautical mile, including Yakobi Island, Kruzoff Island, and Baranof Island. Waters of the Fairweather Banks and other waters in the Dixon Entrance area are also closed. These areas correspond with the southward migration routes of chinook stocks from British Columbia, Puget Sound, and the Columbia River.
4. **Gear Restrictions:** There are no gear restrictions other than those that normally apply in the troll fishery.

2.2.12 Alternative 2-Reduce Chinook Nonretention Fisheries

The objective of Alternative 2 is to minimize incidental mortalities of chinook salmon that would occur under Alternative 1 by reducing CNR fisheries to the maximum extent possible during the summer season troll fishery. Management actions would be taken either

⁴ This is not counted as part of the allowable harvest, but is considered as part of the total stock-specific mortality estimates for the fisheries when NMFS reviews the Southeast Alaska troll fisheries management plan.

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individually or in combination to slow chinook catch rates so that the summer season fishery could continue without resorting to periods of CNR fishing.

1. An overall harvest quota for chinook would be determined in the same manner as under Alternative 1.
2. Management measures would be used during the summer troll fishery to slow chinook catch rates sufficiently to reduce and ideally eliminate the need for CNR fishing. If necessary, CNR fisheries would be allowed to provide access to harvestable coho.
3. Allocation and management provisions related to the winter and spring season troll fisheries would remain unchanged. Provisions related to sport fisheries, purse seine, gillnet, or other gear types would also remain unchanged.

In most respects, management under Alternative 2 would be the same as under Alternative 1. Harvest quotas for chinook and coho would be the same. Regulations for winter and spring chinook troll fisheries and summer season sport and net fisheries would be unchanged from Alternative 1. However, management actions would be taken to slow the catch rate of chinook and to eliminate the need for CNR fisheries with resulting changes in season structure (Table 2.2.1). Those actions include the following:

1. Seasons/Fisheries: The summer season would begin July 1, although a delay in the initial opening would be one of the optional management measures used for reducing chinook catch rates. If necessary, opening and closing dates for chinook salmon retention would be adjusted inseason based on observed harvest rates of chinook, and directed coho fishing would be allowed with CNR fishing to provide access to harvestable coho.
2. Area Closures: Areas of high chinook abundance referred to under Alternative 1 may be closed to decrease chinook catch rates; closures would be adjusted inseason as necessary.

Table 2.2-1. Examples of season structure for the Southeast Alaska troll salmon fishery under Alternatives 1 and 2.

| Relative Abundance | Alternative | Season Description by Statistical Week | Allowable Chinook Harvest | Coho Harvest |
|-------------------------------|-------------|--|---------------------------|--------------|
| Higher Chinook/ Lower Coho | 1 | 1-30 Chinook-Directed (closures as necessary) 31-39 Coho-Directed/CNR 40-52 Chinook-Directed | 281,000 | 1.6 million |
| | 2 | 1-28 Chinook-Directed 28-39 Coho-Directed/CR 40-52 Chinook-Directed | 281,000 | 1.6 million |
| Lower Chinook/ Higher Coho | 1 | 1-29 Chinook-Directed (closures as necessary) 29-39 Coho-Directed/CNR 40-52 Chinook-Directed | 158,000 | 2.1 million |
| | 2 | 1-26 Chinook-Directed 27-40 Coho-Directed/CR 41-52 Chinook-Directed | 158,000 | 2.1 million |

Notes:

CR = Chinook Retention CNR = Chinook Nonretention

The statistical week system refers to the sequence of weeks in the year beginning with January 1.

3. Gear Restrictions/Other: Gear restrictions, in addition to those that would apply to the troll fishery under Alternative 1, may also be used to decrease chinook catch rates and would be adjusted inseason, as necessary, to meet management objectives; however, NMFS is not currently aware of gear-related restrictions that could be used to target coho.

2.2.1.3 Alternative 3-No Incidental Take

The best available science indicates that listed Snake River fall chinook are encountered in fisheries throughout Southeast Alaska (Pacific States Marine Fisheries Commission [PSMFC] 1997). To eliminate incidental take of Snake River fall chinook, it might be necessary to close all fisheries that target chinook or have a substantial chinook bycatch.

Under Alternative 3, all commercial troll and recreational salmon fisheries, with the exception of terminal area “experimental” fisheries targeting Alaska hatchery runs, would be closed in state and EEZ waters throughout the year. Gillnet and purse seine fisheries directed at sockeye, pink, chum, and coho would remain open. Incidental take of listed chinook in these fisheries is thought to be minimal (NMFS 1997a).

2.2.2 Pacific Coast

2.2.2.1 Alternative 1-No Action

Commercial and recreational ocean salmon fisheries in Pacific Coast waters harvest primarily chinook and coho salmon by means of hook-and-line gear and occur from the coastline to approximately 25 miles offshore between the U.S.-Canada Border and Point Conception, California.

As stated in Chapter 1, framework management plans establish conservation objectives for different species in different geographic areas, and annual fishery management plans specify management measures (regulations) for fisheries to meet these objectives.⁵

Conservation objectives most relevant to the analysis of environmental consequences include:

1. Reducing Snake River fall chinook mortality by 30 percent from the 1988-1993 baseline (Baseline 1).
2. Continuing the 3 percent exploitation rate (approximately) on the Puget Sound chinook ESU.
3. Meeting or exceeding requirements for exploitation rates on Oregon Coastal Natural (OCN) coho specified in Amendment 13 to the Pacific Coast Salmon Plan (NMFS 1999c) (20 percent exploitation in higher abundance periods [Baseline 1] and 13 percent in lower abundance periods [Baseline 2]).
4. Continuing the 5 percent (approximately) exploitation rate on Coastal and Puget Sound wild coho stocks.

⁵ In some cases, the stock groups are identical to ESUs identified by NMFS. In other cases, a stock may be included in an ESU or vice versa.

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5. Meeting inriver escapement goals for Klamath chinook (equivalent to approximately 11 percent ocean exploitation rate).
6. Meeting the goal for a 31 percent increase in cohort replacement for the Sacramento River Winter-run ESU.

Depending on stock distribution and abundance and management measures used, a specific conservation objective may be a primary or secondary constraint, or may not be a constraint in a given fishery management area (FMA). Predominant management constraints for FMAs are summarized in Table 2.2-2. All current Council conservation objectives are shown in Appendix A.

Table 2.2-2. Specifications for management measures.

| FMA | Commercial | | | | Sport | | | |
|-----------------|--------------|---------|--------------------------------|------|--------------|---------|--------------------------------|------|
| | Gear Regs | Target | Species Retained ^{1/} | | Gear Regs | Target | Species Retained ^{1/} | |
| | | | | | | | | |
| Alternative 1 | | | | | | | | |
| | | | Chinook | Coho | | | Chinook | Coho |
| North of Falcon | 1, 2 | Chinook | H,W | No | 1 | Both | H,W | H,W |
| Falcon-KMZ | 1, 2 | Chinook | H, W | No | 1 | Both | H, W | H, W |
| KMZ | 1, 2 | Chinook | H, W | No | 1 | Chinook | H, W | No |
| South of KMZ | 1, 2 | Chinook | H, W | No | 1 | Chinook | H, W | No |
| Alternative 2 | | | | | | | | |
| | | | Chinook | Coho | | | Chinook | Coho |
| North of Falcon | 1, 2 | Chinook | H | H | 1 | Both | H | H |
| Falcon-KMZ | 1, 2 | Chinook | H | H | 1 | Both | H | H |
| KMZ | 1, 2 | Chinook | H | No | 1 | Chinook | H | No |
| South of KMZ | 1, 2 | Chinook | H | No | 1 | Chinook | H | No |

Notes:

Gear Regulations: 1=barbless hooks 2=lines limited to 4.

Species Retained: H=hatchery, W=wild.

^{1/}Current minimum size limits for commercial troll chinook (26 inches) and sport chinook (20 inches) pertain.

There is no minimum size limit for sport-caught coho. Season openings are determined as part of the effects modeling process and are specified in Chapter 4.

Alternative 1 does not include recent regulations prohibiting retention of unmarked (naturally spawning) coho in some areas. Mass-mark selective fisheries are considered under Alternative 2 to allow a more focused analysis of this management measure, which has only recently been implemented on a limited scale. NMFS considers use of this approach experimental, requiring further evolution and assessment.

The management measures used under Alternative 1 limit effects on listed ESUs and other weak stocks by setting quota or season limits. Effects on listed ESUs can also be avoided by manipulating season timing, open areas, gear, or sometimes by requiring the release of all fish of the same (taxonomic) species, as in a CNR fishery. The economic efficiency of these approaches is limited by the inability to distinguish, within (taxonomic) species, a particular stock or ESU and the associated discard of fish from relatively healthy stocks. The effectiveness of these approaches for meeting ESA or other management goals is often difficult to evaluate because spatial/temporal distribution of stocks is variable and not fully known; therefore, the harvest rate of a particular stock (especially wild stocks) is also not fully known. When regulations are established based on the highest expected encounter of non-target or listed stocks, fisheries are constrained. If encounter rates of weak or protected

stocks are under estimated in the regulatory assumptions, conservation goals may be compromised (Council 1999a).

Alternative 1 represents the approach currently being used in Council annual fishery management plans (see Council 1999a for a detailed discussion of management objectives and measures).⁶ For this FPEIS the management measures of concern are those that intend to limit the incidental take of fish from at least three chinook ESUs and three coho ESUs, as well as other weak stocks that are as yet unlisted (Table 2.2-2). These management measures include:

1. Quota restrictions that limit harvest (and by extension, incidental take of listed stocks) according to catches achieved as opposed to seasons limited by time.
2. Time and area closures to reduce the harvest on listed chinook or coho ESUs or other stocks for which there are conservation constraints.
3. Species-directed fisheries including chinook-directed/coho nonretention fisheries in California and Oregon, and CNR or coho nonretention fisheries in Washington.
4. Gear restrictions to reduce encounters of non-target salmon species in species-directed fisheries and to reduce mortality of non-target species released in species-directed fisheries.

In general, management measures are applied with reference to management areas (i.e., FMAs), which in turn are established with regard to fishery areas. Management areas are also established with regard to the origin of stocks, likely migration routes, and, thus, interception in fisheries. Fishery management areas used to specify proposed Pacific Coast alternatives are:

- North of Cape Falcon, Oregon
- Cape Falcon-Klamath Management Zone (Cape Falcon-KMZ)
- KMZ
- South of the KMZ

Locations of the FMAs are shown in Chapter 3, Section 3.3.3.1.

2.2.2.2 Alternative 2-Mark-Selective Fisheries

Hatchery-reared salmon constitute the majority of chinook and coho present in Council management areas. Applying a visible, external mark on hatchery-reared salmon provides a means to increase harvest of hatchery stocks while minimizing harvests of natural stocks, including listed ESUs. Mark-selective fisheries reduce fishery effects when mortality from the harvest and release of unmarked fish is less than the direct mortality in a fishery where all fish caught are harvested. Incidental mortality depends on the frequency with which non-targeted fish are encountered and the capture-and-release mortality rate (Council 1999b).

⁶ The Council is responsible for managing EEZ fisheries, but setting regulations for the EEZ is accomplished through consultation with state and Tribal fishery managers and takes into account Indian and non-Indian commercial fisheries and recreational fisheries in Puget Sound, Grays Harbor, Willapa Bay, the Columbia River, San Francisco Bay, the Quinault, Queets, Hoh, and Quillayute rivers on Washington's coast, numerous Oregon streams, and the Klamath River in northern California, as well as fisheries in Alaska and British Columbia.

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Requiring unmarked fish to be released reduces harvest efficiency and results in waste associated with the captured and released fish that die. Mark-selective fisheries have been used on a limited basis in Council-managed fisheries since 1999.⁷

Most management measures under Alternative 2 would be similar to those under Alternative 1 except for the following:

1. Rather than regulate fisheries with time/area closures and (taxonomic) species-selective harvest, fisheries would be managed to selectively harvest hatchery-reared fish.
2. State, federal, and Tribal agencies would mark the hatchery-produced chinook and coho salmon intended for harvest with an external mark that could be recognized by fishermen. Unmarked chinook and coho, including those from naturally spawning populations in listed ESUs, would be released by anglers and commercial fishermen.

Under Alternative 2 two options are considered that distinguish how the conservation benefits of mark-selective fisheries may be used. Option A, representing a less restrictive application of mark-selective fisheries, would maximize the duration of sport fishing seasons and the value of commercial harvest while still meeting conservation objectives. Option B, representing a more restrictive application of mark-selective fisheries, would meet or exceed conservation objectives while approximating the fishing opportunity possible under Alternative 1. As with Alternative 1, specific management measures for Alternative 2 would vary by FMA (Table 2.2-2).

2.2.2.3 Alternative 3-No Incidental Take

Under Alternative 3, NMFS would not issue an ITP for a proposed fishery management plan; however, fish could be available for harvest in inside waters (e.g., Puget Sound, Columbia River, San Francisco Bay, and other estuaries). Promulgating fisheries in these areas is under the control of the state and Tribal fishery managers and is subject to review by NMFS through a Section 7 or Section 10 consultation. Alternative 3 would have the greatest effect on the human environment because it would eliminate fisheries that have been in place and relied upon for decades.

2.2.3 Columbia River Basin

2.2.3.1 Alternative 1-No Action

Salmon and steelhead fishing occurs throughout the Columbia River basin, and listed salmon and steelhead stocks may be taken in all mainstem fisheries and in most Columbia River basin tributaries. In tributaries where only listed fish are present, or where listed fish predominate, fisheries are generally closed. The “all-citizens” commercial fisheries occur from the river mouth upstream to Bonneville Dam in Management Zones 1-5, and Tribal

⁷ Regulations requiring the release of wild-spawning (unmarked) steelhead have been commonly applied in freshwater fisheries since 1980. After several years of study, the WDFW and Oregon Department of Fish and Wildlife (ODFW) began mass-marking hatchery coho in 1996 by removing the adipose fin; approximately 80 percent of the progeny of the 1999 brood year was marked in both agencies. Oregon currently marks hatchery-reared spring chinook from the Willamette River but has no plan to mark fall chinook. Washington is developing a large-scale mass-marking program for chinook. California does not have a mass-marking program.

commercial and ceremonial and subsistence fisheries occur above Bonneville Dam (Management Zone 6) and in tributaries throughout the Columbia River basin. Recreational fisheries also occur throughout the Columbia River and its tributaries. Drift gillnets are used in the all-citizens commercial fishery and are also, with set gillnets, used in the Tribal commercial fishery. Hoop nets, dip nets, hook-and-line, and (in one case) spears are used in the ceremonial and subsistence fisheries. Hook-and-line is the only gear type used in recreational fisheries.

Before 2000, fisheries in the Columbia River basin were proposed and managed by the States of Oregon, Washington, and Idaho⁸ and the four member Tribes of the Columbia River Intertribal Fish Commission (CRITFC) under the terms of the Columbia River Fisheries Management Plan (CRFMP) and associated management agreements.^{9,10} The CRFMP expired by its own terms on December 31, 1998, but was extended by agreement among with of the parties through July, 1999. Since then fisheries have been managed using the procedure contained in the CRFMP, and management objectives contained in subsequent short-term management agreements that have been considered by NMFS through their section 7 consultations. The management objectives have evolved through time from those contained in the CRFMP as a result of recent listings. Alternative 1 represents a point in time in that evolution. It includes escapement goals, harvest guidelines, management measures, harvest sharing and rebuilding requirements, recent NMFS consultations for tributary fisheries, and existing harvest guidelines in Columbia River tributaries, which represents the approach recently used by the parties to the CRFMP.¹¹ Management measures for Columbia River fisheries are summarized in Table 2.2-3. The management measures used to achieve these conservation objectives are intended to limit or avoid capture of salmon and steelhead from listed ESUs and unlisted stocks for which there are conservation concerns while allowing harvest of stronger stocks. Unlike Alternative 1 for Southeast Alaska and the Pacific Coast, Alternative 1 for the Columbia River basin management area is based on observed management measures for the baselines analyzed.¹²

⁸ Although Idaho was a party to *U.S. v. Oregon*, it was not a signatory party to the CRFMP.

⁹ In 1996 parties to the CRFMP negotiated management agreements effective until 1998. The agreements were in partial fulfillment of the August 1995 settlement agreement adopted by the U.S. District Court in which the parties agreed to enter into discussions regarding the possibility of amending the CRFMP.

¹⁰ Potential management constraints imposed by the 1999 Pacific Salmon Treaty Agreement were considered in the evaluation of harvests under Alternative 1. Biologically based escapement goals have been developed and accepted by the Chinook Technical Committee (CTC) for one of the four indicator stocks in the Columbia River (i.e., Lewis River wild chinook [5,790 fish]) (Pacific Salmon Commission 1999b; J. Clark, ADF&G, personal communication). An interim biologically based escapement goal has been developed for Upper Columbia summer chinook (interim 90 percent CI goal range: 14,200 to 25,000 fish at Bonneville Dam and 9,658 to 17,026 fish at Rock Island Dam) but this goal has not been accepted by the CTC and it is not currently used to determine whether PST constraints are implemented. This interim goal is considerably lower than the existing goal at Bonneville Dam (80,000 to 90,000 fish) because it is based on current habitat conditions. Evaluation of fall upriver bright chinook and Deschutes River chinook is to be completed by fall 2000. From 1988 to 1997, the observed escapement levels of Lewis River wild chinook exceeded the minimum guidelines established by the Pacific Salmon Treaty (i.e., two consecutive years where escapement was below the lower goal). Escapement levels of Upper summer chinook would have also met PST requirements if the CTC interim goal was used as the threshold. Given the available goals and escapement levels, the PST harvest constraint (40 percent harvest rate reduction from 1979 to 1982) would not have been implemented in Columbia River basin fisheries from 1988 to 1997.

¹¹ Certain provisions of the CRFMP were modified by agreement of the parties to incorporate additional management measures for listed species. There were separate agreements covering the summer season fisheries and fall season fisheries that applied from 1996 to 1998. The agreement on spring fisheries was extended through July 1999.

¹² Relatively small numerical adjustments were made for each year to account for more conservative objectives for upriver fall chinook and sockeye salmon. Alternative 1 is derived primarily from the 1996-1998 management agreements that superseded portions of the CRFMP.

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Description of Alternatives

Management measures most directly related to the proposed alternatives include the following:

1. Harvest quotas for commercial and Tribal fisheries
2. Restrictions on fishing seasons and fishing areas for all fisheries
3. Gear restrictions, especially on gillnet dimensions.
4. Species retention prohibitions
5. Mark-selective sport steelhead fisheries

Bag limits for sport fisheries and size limits for sport and commercial fisheries are also used.

Management measures vary by fishery zone and fishery type (e.g., non-Tribal commercial, Tribal commercial, Tribal ceremonial and subsistence, and sport). Management measures used under Alternative 1 are shown in Table 2.2-4.

2.2.3.2 Alternative 2-Live Capture, Selective, and Terminal Fisheries

Alternative 2 for the Columbia River Basin considers the environmental consequences associated with live capture and selective fisheries, as well as the use of terminal area fisheries. As stated earlier, applying a visible, external mark on hatchery-reared salmon provides a means to increase harvest of hatchery stocks while minimizing harvests of natural stocks, including listed ESUs. Mark-selective or species-selective fisheries reduce fishery effects when mortality from the harvest and release of non-targeted fish is less than the direct mortality in a fishery where all fish caught are harvested. Incidental mortality depends on the frequency with which non-targeted fish are encountered and the capture-and-release mortality rate (Council 1999). Requiring unmarked fish to be released reduces harvest efficiency and results in some waste associated with the captured and released fish that die, but may also allow greater access to harvestable fish. Because harvest rates in mixed stock fisheries are limited by weak stock management concerns, hatchery and some healthy natural stocks or species will, at times, go unharvested. In some cases, this surplus can be more fully utilized by implementing selective fisheries. Even so, fish that are surplus to escapement needs will often return to terminal areas where they can, at least potentially, be targeted in terminal area fisheries. Alternative 2, therefore, considers the use of live capture, selective fisheries and how they may be used in conjunction with terminal fisheries.

Under Alternative 2, the conservation constraints assumed under Alternative 1 would be the same. Several management measures would be the same as those under Alternative 1 but three important changes would be made as follows:

1. State, federal, and Tribal agencies would mark the hatchery-produced chinook and coho salmon intended for harvest with an external mark that could be recognized by fishermen. Unmarked steelhead, chinook, and coho salmon, including those from naturally spawning populations in listed ESUs, would be released.
2. Mixed stock fisheries would be managed primarily to selectively harvest hatchery-reared fish. Two options for management are considered. Under one option, selective fisheries in mixed stock areas would be coupled with terminal fisheries in areas where incidental harvest of listed ESUs is exceptionally low (e.g., Hanford Reach). Encounter

Table 2.2-3. Specification of management measures for main Columbia River fisheries under Alternative 1.

| Fishery | Allowable Gear | Time | Area | Harvest Quota, Bag Limits, Other |
|--|---|--|---|--|
| Management Measures for Lower Columbia (Zones 1-5) and Tributaries | | | | |
| All Citizens Commercial | Drift Gillnet— Restrictions include length and depth of net and size of mesh. | Fall only | Primarily “SAFE” areas | Harvest guideline set to achieve all-citizens share of CRFMP-mandated incidental mortality of critical stocks. Spring, summer, and fall chinook and steelhead all managed to specific harvest rate requirements. |
| Tribal Ceremonial and Subsistence | Dip net | Spring | Willamette Falls | |
| Recreational | Hook-and-line | Limited winter, spring, and fall fisheries; summer fisheries in mainstem Columbia River mostly closed. | Columbia River and tributaries as set by state regulations. | Size and bag limits; species-selective fisheries. Also subject to same harvest guideline limits as above. |
| Management Measures for Mid-Columbia (Zone 6) and Tributaries | | | | |
| Tribal Ceremonial and Subsistence and Commercial | Set gillnet, hoop nets, dip nets, hook-and-line. | Year-round with stock/ tributary specific closures set by Tribes and state agencies. | Columbia River mainstem and tributaries may use specific area restrictions in mainstem to target hatchery fish. | Sockeye, steelhead, summer chinook, spring chinook, and fall chinook runs all managed to specific harvest rate limits. |
| Recreational | Hook-and-line restrictions include number, size, and type of lures, bait, and/or hooks, number of rods. | Limited winter, spring, and fall fisheries; summer fisheries in mainstem Columbia River mostly closed. | Columbia River and tributaries as set by state regulations | Bag limits; species-selective fisheries and mark-selective fisheries for steelhead. |
| Management Measures for Upper Columbia (above Zone 6) and Tributaries | | | | |
| Tribal Ceremonial and Subsistence or Commercial Chinook Fishery | Set gillnet | Fall | Hanford Reach of Columbia | Directed fishery for wild Hanford Reach chinook; other salmonids retained; harvest quota set by escapement goal. |
| Tribal Ceremonial and Subsistence or Commercial Sockeye Fishery | Closed | Closed | Closed | Closed |
| Tribal Ceremonial and Subsistence Chinook Fishery (Snake River) | Hoop nets, dip nets, spears, hook-and-line | Based on run timing to terminal areas. | Snake River and tributaries | Harvest quotas set by escapement in terminal areas. |
| Recreational | Hook-and-line restrictions include number, size, and type of lures, bait, and/or hooks, number of rods. | Limited winter, spring, and fall fisheries; summer fisheries in mainstem Columbia mostly closed. | Columbia River and tributaries as set by state regulations. | Bag limits, species selective fisheries |
| Notes: “SAFE” = selective | | | | |

Table 2.2-4. Specification of management measures for main Columbia River fisheries under Alternative 2.

| Fishery | Allowable Gear | Time | Area | Harvest Quota, Bag Limits, Other |
|---|---|---|--|--|
| Management Measures for Lower Columbia (Zones 1-5) and Tributaries | | | | |
| All Citizens Commercial | Tangle net, beach seine, trap, fish wheel or other live capture means | Fall | SAFE areas in Columbia River; Gillnets only in “SAFE” areas. | Mark-selective fishery for hatchery chinook and coho. Harvest guideline same as under Alternative 1. |
| Tribal Ceremonial and Subsistence | Dip net | Spring | Willamette Falls | |
| Recreational | Hook-and-line | Winter, spring, and fall fisheries; most summer fisheries remain closed. | | Mark-selective fishery for hatchery chinook, coho, and steelhead; harvest guideline same as under Alternative 1; bag limits could be adjusted if effects on wild stocks are low enough. |
| Management Measures for Mid-Columbia River (Zone 6) | | | | |
| Tribal Ceremonial and Subsistence and Commercial | Tangle nets, hoop nets, dip nets, traps, fish wheels or other “live capture” gear, hook-and-line | Year-round with stock/tributary specific closures set by Tribes and state agencies. | | Mark-selective fishery for hatchery chinook, coho and steelhead. No directed fishery on sockeye. Directed fisheries possible on hatchery-reared steelhead, and summer chinook if incidental mortality on wild run component meets NMFS guidelines. |
| Recreational | Hook-and-line restrictions include number, size, and type of lures, bait, and/or hooks, number of rods. | Winter, spring, and fall fisheries. Most summer fisheries remain closed. | | Mark-selective fishery for hatchery chinook, coho and steelhead. Harvest guideline same as Status Quo. Bag limits could be adjusted if effects on wild stocks are low enough. |
| Management Measures for Upper Columbia (Above Zone 6), Snake River, and Tribes | | | | |
| Tribal Ceremonial and Subsistence or Commercial Chinook Fishery | Tangle nets, hoop nets, dip nets, traps, fish wheels or other live capture gear; hook-and-line | Fall | Hanford Reach of Columbia | Directed fishery for wild Hanford Reach chinook; harvest quota set by escapement goal; unmarked steelhead released. |
| Tribal Ceremonial and Subsistence or Commercial Sockeye Fishery | Tangle nets, hoop nets, dip nets, traps, fish wheels or other live capture gear; hook-and-line | | Above Snake River Confluence | Directed fishery for wild sockeye salmon originating from upper Columbia River tributaries; harvest quota set by escapement goal for upper Columbia River. |
| Tribal Ceremonial and Subsistence Chinook Fishery (Snake River and Tribes.) | Live release gear or hook-and-line | | Snake River and Tributaries | Mark-selective fishery harvests only marked (hatchery-reared) chinook and steelhead; harvest goal set by stock-specific escapement goal in terminal areas. |
| Recreational | Hook-and-line restrictions include number, size, and type of lures, bait, and/or hooks, number of rods. | Winter, spring, and fall fisheries. | Snake River and Tributaries | Mark-selective fishery for hatchery chinook, coho and steelhead; gear restrictions same as the status quo harvest guideline set to achieve all-citizens’ share of hatchery-reared salmon or CRFMP-mandated incidental mortality of critical stocks. Bag limits could be adjusted if effects on wild stocks are low enough. |
| Notes: “SAFE” = selective | | | | |

rates are assumed to be the same as under Alternative 1 with all unmarked fish released. Catches in mixed stock areas are therefore reduced with additional wild fish accruing to escapement. Fish in excess of escapement goals for hatchery and healthy wild populations are assumed caught in terminal fisheries. Although tribal participation in selective fisheries is discretionary, the analysis assumes the tribes will also implement selective fishing methods. A second option would consider only the use of live capture, selective harvest techniques in mixed stock areas.

3. Gear types for which incidental mortality of released fish is relatively low (e.g., modified gillnets, hoop nets, dip nets, beach seines, traps, fish wheels, and hook-and-line¹³) would be required for non-Tribal fishermen and recommended for Tribal fishermen for areas and times where listed salmon are likely to be encountered.

As with Alternative 1, application of management measures under Alternative 2 varies by fishery zone and fishery (Table 2.2-4).

2.2.3.3 Alternative 3-No Incidental Take

Under Alternative 3, NMFS would not issue an incidental take permit for a proposed fishery management plan, and fishery-related effects to listed salmon and steelhead stocks would be eliminated. This alternative would result in extensive socioeconomic effects for the Columbia River basin region because it would eliminate fisheries that have been in place and relied upon for decades.

2.3 Alternatives Considered but Excluded from Further Analysis

2.3.1 Alternatives Not Directly Relevant to Actions

Three alternatives suggested during the scoping process and discussed during the internal consultation process are 1) replacement of commercial salmon fisheries with captive salmon aquaculture, 2) buyback of commercial fishing permits, and 3) closure of hatcheries. These alternatives were considered outside the scope of this FPEIS because they were not relevant to the action (see Section 2.2 to review the evaluation criteria).

2.3.1.1 Captive Aquaculture

Captive aquaculture programs (as distinguished from hatchery rearing for fisheries) could reduce the need for commercial fisheries. None of the three jurisdictions regulate, promote, or fund captive aquaculture activities; therefore, they would not incorporate captive aquaculture projects as part of a fishery management plan. The development of captive aquaculture does have some relevance to the consideration of economic effects. Reduced commercial fishing and the associated reduced income may be offset by fish farms but benefits would likely accrue to different sectors (i.e., fish farm income would probably not transfer to commercial fishers). Because fish farms are not within the direct purview of federal management, and because the scope of fish-farm development and their resultant economic benefits vary to an unknown extent, they are not considered further.

¹³ Choice would be dictated largely by the gear that is most effective at live capture.

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2.3.1.2 Fleet Reduction

States license commercial and charterboat operations for non-American Indians. Tribes separately issue licenses for Tribal fishers. Washington has a limited entry program that caps the number of commercial and charterboat permits, and Alaska has a similar limited entry cap for commercial fishers. By contrast, Oregon and California do not limit the number of troll or charterboat permits and are required by state administrative code to make a minimum number of permits available. Management agencies responsible for the respective jurisdictions could elect to reduce fishing capacity through retirement or re-purchase of permits. NMFS (on behalf of the Secretary of Commerce) could recommend fleet reduction to the states. Several federally funded programs have been implemented over the past two decades that reduce fishing capacity by purchasing and retiring commercial fishing permits and charterboat fishing permits (see Chapter 3); however, fleet reduction requires legislative action by the states and is, therefore, a separate action and not a reasonable alternative. To some extent, analyzing a fleet reduction alternative is redundant with the No-Action Alternative because these programs have been recently used in the Columbia River basin and Council management areas.

2.3.1.3 Hatchery Closures

In Alaska decisions regarding hatchery operations are made by non-profit associations but in other areas, states, Tribes, and federal agencies make the decisions. Operational decisions such as closure are made, for the most part, through processes and authorities not directly related to the action being considered in this FPEIS; therefore, they are not considered further. Although closure of hatcheries was eliminated as an alternative, it is evident that hatchery operations can have substantial effects on listed populations and that some of these effects can be amplified by fishery management actions. Because of these effects, the issue of hatchery operations/closures is considered in Chapter 4.

2.3.2 Other Alternatives Eliminated

Alternatives that were considered relevant to the action were screened further according to the remaining criteria as described in Section 2.2 (i.e., redundancy, consistency with conservation objectives, and technical and economic feasibility). A brief description of those other alternatives eliminated from further consideration follows in the sections below and are arranged by management area (Southeast Alaska, Pacific Coast, and Columbia River basin).

2.3.2.1 Southeast Alaska

Curtailing Chinook Fisheries

Fish from listed salmon stocks comprise a small portion of the Southeast Alaska catch. Curtailing chinook fisheries in Southeast Alaska forecloses harvest opportunity on the healthy chinook stocks, which comprise the majority of harvest (NMFS 1997a). The direct biological and socioeconomic effects of a chinook fishery closure can be interpreted from analysis of the effects of Alternative 3-No Incidental Take.

Mark-Selective Fisheries

Mark-selective fisheries were determined to be economically inefficient and potentially wasteful of the biological resource in Southeast Alaska troll salmon fisheries because the low proportion of hatchery chinook (less than 50 percent) in the harvest (NMFS 1997a) would result in high incidental mortality and low harvest-per-unit-effort.

Major Gear Changes

Without the ability to distinguish between wild and hatchery fish, the usefulness of more benign capture methods to reduce incidental mortality on wild stocks would be limited to (taxonomic) species-selective fisheries (e.g., a CNR fishery, which is a main component of Alternative 1-No Action). Use of alternative gear types in species-selective fisheries and the reasons for excluding them from further analysis are summarized in Table 2.3-1. Additional comments are provided below:

Fish traps

Used extensively in Alaska before the 1950s, fish traps would allow species-selective fishing with a relatively low incidental mortality rate. Historically, fish traps used in Southeast Alaska were located along migration routes in inside waters (generally inside and among the islands off the coast of Southeast Alaska) or near spawning streams. Traps could be located at some sites adjacent to the open ocean. Although reinstituting the use of fish traps would offer a high potential to reduce mortality of released chinook in a species-selective fishery, they could cause a large degree of social disruption if they were to replace the troll fleet.

Tangle nets

Used as an alternative gear type in the Columbia River basin, tangle nets could be fished from some troll vessels in Southeast Alaska. Tangle nets are efficient only where fish are highly concentrated because the nets must be retrieved frequently to work properly; therefore, they are not a viable gear in the open ocean where fish are more dispersed.

Purse seine fishing

A lower mortality rate on released chinook in a species-selective fishery could be achieved with purse seine fishing; however, research on mortality with seine gear is limited and inconclusive. The Southeast Alaska purse seine fleet does have the necessary capacity to harvest coho migrating to inside waters. The incidental harvest of chinook could be reduced by allocating more coho to the seine fleet, but would displace troll fishermen.

Relocation of more troll fishing to inside waters to take coho

With this approach, efficiency of hook-and-line fisheries might decrease because mature fish tend to bite less readily after they leave open ocean feeding grounds. Relocation might also compromise the strategy used by ADF&G to manage coho, which relies on harvesting a majority of coho in ocean areas where stocks from many spawning streams are mixed.

Chapter 2

Description of Alternatives

Table 2.3-1. Potential modifications to harvest management for Southeast Alaska fisheries that were excluded from further analysis.

| Alternative/Harvest | | | |
|--|-----------------------------------|--|---|
| Method | Type of Fishery | Benefits | Problems/Unknowns |
| Curtail chinook-directed fisheries | CNR fisheries only | Allows escapement of all wild chinook previously taken in troll/sport fisheries. | Unable to utilize chinook from healthy runs; possible increase in bycatch mortality. |
| Mark-selective, hook-and-line, or other gear | Mixed-stock | Allows release of wild chinook. | Wild component of chinook run >50 percent leading to high incidental mortality and an economically inefficient fishery. |
| Tangle nets | Species selective (coho directed) | Possibly lower catch-and-release mortality for chinook. | Inefficient in open ocean. |
| Fish traps | Species selective (coho directed) | Potentially lower capture-and-release mortality on chinook. | Higher chinook bycatch rates in some locales; large degree of social effect; unable to utilize chinook from healthy runs. |
| Purse seine | Species selective (coho directed) | Possible savings in incidental mortality of released chinook. | Perhaps higher contact rate with chinook in near-shore areas where seining is more efficient; mortality rate for seine-caught fish uncertain; economic re-allocation to another fleet segment socially disruptive. |
| Re-direct coho harvest to inside waters. | Species selective (coho directed) | Lower chinook encounter rate. | Unable to utilize chinook from healthy runs; potentially less efficient for trollers because of reduced feeding tendency on part of mature coho; potential disruptions to coho mixed-stock harvest management strategy. |

This strategy has been in place for 20 years and is considered highly successful by ADF&G.¹⁴ Harvesting in inside waters where runs are separated and high volume fisheries such as purse seining or gillnetting occur could lead to overharvest of a particular run component.

2.3.2.2 Pacific Coast

Major Gear Changes

A conservation advantage to replacing hook-and-line gear with net gear in commercial fisheries would exist in a fishery targeting a single species (or a fishery targeting marked fish) if the mortality for the released fish were lower than with hook-and-line gear. Although only hook-and-line gear is currently legal,¹⁵ Council-managed ocean fisheries considered other harvest methods for their potential to reduce take of listed species (e.g., changing commercial gear from hook-and-line to purse seines, gillnets, tangle nets, or traps). Ultimately, these alternative harvest methods were rejected because 1) a review of the literature suggested mortality rates for gillnets is much higher than for hook-and-line

¹⁴ Since 1980 this management strategy has resulted in an average 41 percent exploitation rate for coho in the troll fishery. Many of the drift gillnet fisheries are located in areas of large populations of coho salmon and have directed fisheries on stocks that are managed for escapement goals. Since 1980 escapement goals for the indexed rivers have been achieved 87 percent of the time (personal communication, Dave Gaudet, ADF&G, April 24, 2000).

gear, 2) tangle nets likely have a lower mortality rate than gillnets, and 3) the mortality rate for purse seines is not known with certainty. Alternative gear considered for Pacific Coast fisheries and the reasons for excluding them from further analysis are summarized in Table 2.3-2. Additional comments are provided below.

Fish Traps

While likely to afford the lowest mortality for non-target species, trap fisheries use relies on intercepting fish whose migratory path is concentrated by shore or bottom topography. A technology for open-ocean applications has not been developed.

Tangle Nets

Although they might be more readily fished from boats the size of those currently used in the troll fleet, tangle nets were rejected because it is unlikely they could be fished at depths deep enough to take chinook. Their effectiveness relies on fish being relatively concentrated and on the ability to frequently retrieve the net before fish escape from it, conditions which probably could not be met in the ocean. Tangle netting also has the same economic shortcomings as purse seining (i.e., profitable ocean harvesting operations rely on higher-priced chinook in the harvest, and a gear capable only of targeting coho is not economically viable).

Purse Seine Fishing

While effective for coho in some major migration corridors, purse seining would likely be ineffective for chinook in most offshore areas because this species travels and feeds deeper than traditional seine gear can be fished. While purse seining for coho might be more operationally feasible than for chinook, it is probably economically infeasible because of the relatively low ex-vessel price of coho and the increased fixed and variable costs associated with seining. Transferring effort from the existing inshore purse seine fleet would displace existing commercial fishers. Tribal fishers who take approximately 50 percent of the commercial salmon harvest in areas off the Washington coast could not be required to change to purse seine.¹⁶

2.3.2.3 Columbia River Basin

The allowable gear types considered under Alternative 2 for the Columbia River fisheries are listed in Table 2.2-4. No alternative harvest methods or gear types for Columbia River basin fisheries were proposed.

¹⁵ Net gear was historically used in some ocean areas for harvesting salmon but was outlawed in the early 1950s.

¹⁶ Tribes with treaty fishing rights in Oregon and California harvest salmon mainly in freshwater fisheries.

Chapter 2

Description of Alternatives

Table 2.3-2. Potential gear types for Pacific Coast fisheries that were excluded from further analysis.

| Gear | Type of Fishery | Benefits | Problems/Unknowns |
|------------------|--------------------------|--|--|
| Purse seine gear | Coho-directed commercial | Possible decrease in mortality on chinook encountered; coho-directed fishery is probably only a useful tool North of Falcon. | <p>No benefit for sport; probably not effective for chinook capture in offshore areas because of depth of migration/feeding; reduction in catch-and-released mortality is uncertain; very high entry cost for existing commercial fleet to purchase boats, etc.</p> <p>Not economically feasible in part because prices for coho are depressed relative to historical levels and coho-directed fisheries would have to be very high volume. Would rely on government subsidy or transferring effort of existing purse seine fleet, which would displace existing commercial fishers. Probably unenforceable for Tribal fisheries that take approximately 50 percent of harvest North of Falcon. Net fisheries are currently not authorized in ocean areas.</p> |
| Purse Seine | Chinook directed | Possible decrease in mortality for coho encountered. | No benefit for sport; probably not effective for chinook capture in offshore areas because of depth of migration/feeding; very high entry cost for existing commercial fleet to purchase boats, etc. Not economically feasible; would rely on government subsidy or transferring effort of existing purse seine fleet, which would displace existing commercial fishers. |
| Gillnet | | No benefit; negative benefit for mortality. | |
| Tangle Net | | Perhaps decrease mortality on incidentally caught fish. | Method inefficient in open ocean. |
| Traps | | Decrease mortality on released species. | No benefit for sport; relies on intercepting fish whose migratory path is concentrated by shoreline or ocean bottom topography; technology for open ocean not developed. |